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ABSTRACT

Noting children's inclination for things mathematical, this booklet of activities was written to help parents: use home activities to challenge their children's minds; to help parents and children enjoy mathematics; and to help parents ask their children questions that will get them thinking. The activities in the booklet require no special equipment or detailed planning, and can be incorporated into children's daily routines. The activities are intended to promote the learning and development of the "whole child," and build language skills, thinking and problem-solving abilities, social skills, large and small motor development, and general knowledge, as well as mathematics skills. Following directions for proceeding at the child's own pace, the booklet begins with an introduction to the big concepts in mathematics, with some general strategies for helping children learn them. The booklet then presents the suggested mathematics activities for specific areas of the daily routine: "Getting Up in the Morning," "At the Grocery Store," and "Meal Time." Activities in each section are marked as to level of difficulty. The booklet's appendix lists children's books and other resources that deal with different math topics. (HTH)

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Early Childhood: Where Learning Begins

Mathematics

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Early Childhood: Where Learning Begins Mathematics

mathematical activities for parents and their 2- to 5-year-old children

By Carol Sue Fromboluti
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Preface

Math is all around us. Every day as children play they are using mathematics without even realizing it. Don't believe it? Ask yourself these questions: At the grocery store, do they want to play with the scales? At home, do they like to pour water in and out of cups? Do they like to stack pots and pans? Sort things? Do they like to count—their toys, their friends, or just about anything? You probably answered yes to many of these questions. These and many more everyday activities build your children's growing understanding of mathematics.

This booklet was written with several goals in mind. It is to help parents of very young children—ages 2 to 5—use home activities to challenge their children's minds. First, you need to see that mathematics is everywhere. You use math every day—when you shop for groceries, cook dinner, share a pizza, ride a bus, or watch a basketball game. Even if you don't think you are very good at mathematics, you are already using it successfully!

A second goal is to help you and your children enjoy mathematics. Maybe you didn't think mathematics was fun when you were in school, but when children play with mathematics in their everyday lives they can grow up loving it. Children learn by doing—by moving, touching, tasting, feeling, and seeing. They learn by asking questions. You can use your children's natural curiosity about the world to help them learn.

A third goal is to help you ask questions and get your children thinking. It is not just the activities that children do that help them learn, but the questions you and your children both ask and the things you point out that get them thinking mathematically. We have tried to explain some of the reasons for activities so that you can better answer your children's questions and ask them your own questions.

There is growing evidence from research that preschool children can solve simple problems and love to do so. Children learn best when they find answers for themselves and in their own way. You don't need to spend a lot of money on flash cards or workbooks. Children learn when the problems arise out of their everyday lives. Don't be afraid to ask your children to figure out the answers to simple problems during the day. Give them time to think about the answer, but don't push them. Don't worry if they can't figure it out or don't solve it the way you think they should. Your children are thinking! You are encouraging your children's thinking and imagination. However, don't let them get frustrated. Help them by thinking out loud as you solve the problem with them.

As you read through the activities, you may discover that you are already doing some of them. Keep doing them. Try some new ones. Create your own. When you complete an activity, be sure to ask your children what they learned. Think about what you just experienced. The more your children encounter mathematics, the more comfortable they will be with it. Plus, mathematics activities from real life help children develop language as they ask questions, develop fine motor skills as they touch and move objects, and improve social skills as they work with you or others on a problem. So play games, talk about how, what, why, and how many, and enjoy the learning process. Math is fun!

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Introduction

Mathematics helps children make sense of the world around them and find meaning in the physical world. Through mathematics, children learn to understand their world in terms of numbers and shapes. They learn to reason, to connect ideas, and to think logically. Mathematics is more than the rules and operations we learned in school. It is about connections—seeing relationships in everything we do.

Children learn best when they are interested and even excited about what they are doing. As a parent, you have the special opportunity to make the most of the moments during the day when your children are curious. Toddlers may just point to objects saying "dat?" to ask what it is. Describe it for them, "Oh, that's a pink flower" or "the chair has a square seat." As your children get older, they may ask "how many?" or "what color. . . ?" These questions encourage children to think. Teachers and schools must plan activities, but you don't have to plan in advance. Just take advantage of learning opportunities that happen naturally. You can turn these times into teachable moments. When you use daily events that have meaning to your children, the impact is very powerful.

Give your children many opportunities to see and hear different things, and to move about and play with things they can touch. Let them collect things, and show you and tell you things in their own way. You don't have to "teach" your children facts or math rules or even organize their mathematical learning. Rather, encourage them to ask questions: questions that require more than a simple yes or no, like "what would happen if. . . ?" Encourage children to think. Also, ask them questions and allow them to explore different ways of solving problems. If they seem to be going way off the mark, lead them back by starting with the part of their approach that was logical. Always show respect for their thinking and accept their point of view. Remember, children think much differently than adults. Take your time. Children, including those with special needs, tire easily. It is better to go lightly and keep their interest than to push too hard.

All of the activities in this booklet could be done during your children's daily routines. They require no special equipment or detailed planning. Use them to do something pleasant with your child, add some interest to an otherwise routine activity, or just keep your children interested or occupied. But remember, it is not just the doing but the thinking that promotes learning. The questions you ask your children and the questions they ask you are very important. We have tried to suggest how you might ask your children interesting questions and build on their answers. Hopefully, these activities will make your day easier and more productive.

How to Use This Booklet

The activities in this booklet are designed to promote the learning and development of the "whole child." In other words, we are not just focusing on developing mathematics in young children. Instead, we are giving you sets of activities that provide young children with experiences that will help to get them ready for kindergarten. These activities build language skills, increase thinking and problem-solving abilities, develop social skills, promote large and small muscle development, and increase general knowledge.

We are focusing attention on children's early lives before they enter school. Children's development is nourished through everyday play and explorations of the world around them. Therefore, it is important that families support young children's learning and play, answer their questions, take care of their physical health needs, and stir their natural curiosity in order to lay foundations for success in school and beyond.

A few words about the booklet's organization. We begin with What Is Mathematics—an introduction to the big concepts in mathematics with some general strategies on how you can help your children learn them. This is followed with Activities for Your Day. We have taken times from your everyday routine and suggested some mathematics activities that might easily fit into those routines. These are described in sections such as Getting Up in the Morning, At the Grocery Store, and Meal Time to help you fit mathematics into your children's daily routine. In the back of this booklet you will find an Appendix with two parts: Books lists a number of children's books about different math topics; and Other Resources lists Web sites, CD-ROMs, and other resources that deal with math.

You may find that your 2- to 3-year-old child is ready only for some of these activities, while your 4- to 5-year-old can do many of them. Every child develops at his or her own pace. To help you identify activities appropriate for your child, we have used symbols. The ● is for the simplest tasks, ▲ for those of moderate difficulty, and ■ for the most challenging activities. Usually, younger children will enjoy the ● activities the most, but every child is different. Try the activities and match them to your child's interests and skills. A little challenge is fun, but too much can be frustrating.

Go at Your Child's Pace

All children love to have things repeated even when they already know them, so don't hesitate to do things over and over again. In fact, repetition is how children practice what they are learning—and practice improves learning. Some children may need extra guidance when doing some activities. The younger the child, the more important it is to keep the activities short, and focus on the activities that use objects your child can touch and play with.

All children do not develop at the same rate. Many children are able to accomplish certain things at specific ages. For example, at 2 years of age, many children can turn pages in a book, say two or three words together, and kick a ball. Other children may not do some of these things until they are closer to 3 years old.

Some children who have disabilities or chronic health conditions may need extra time to develop and learn. Just because they have a special need does not mean that they cannot take part in the activities in this booklet. In fact, it is particularly important that they are given opportunities to participate and learn. However, it may be necessary to make some of the activities shorter, to use adapted materials or language, and to repeat the activities more frequently. Just make sure the activities are appropriate and not frustrating.

What Is Mathematics?

The National Council of Teachers of Mathematics (NCTM), the world's largest organization devoted to improving mathematics education, is developing a set of mathematics concepts, or standards, that are important for teaching and learning mathematics. There are two categories of standards: thinking math standards and content math standards. The thinking standards focus on the nature of mathematical reasoning, while the content standards are specific math topics. Each of the activities in this booklet touches one or more content areas and may touch all four thinking math areas.

The four thinking math standards are problem solving, communication, reasoning, and connections. The content math standards are estimation, number sense, geometry and spatial sense, measurement, statistics and probability, fractions and decimals, and patterns and relationships. We have described them and then provided general strategies for how you as a parent can create your own activities that build skills in each of these areas.

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Thinking Mathematics

Problem solving: Problem solving is key in being able to do all other aspects of mathematics. Through problem solving, children learn that there are many different ways to solve a problem and that more than one answer is possible. It involves the ability to explore, think through an issue, and reason logically to solve routine as well as nonroutine problems. In addition to helping with mathematical thinking, this activity builds language and social skills such as working together.

What parents can do:

- Children are naturally curious about everyday problems. Invite your children to figure out solutions to everyday situations. You can do this by talking about the problem, asking your children for ways to solve it, and then asking how they came up with those solutions.
- Encourage your children to suggest problems and ask questions, too. Your children will learn how to figure things out and will learn that many problems can be solved several different ways.

Communication: Communication means talking with your children and listening to them. It means finding ways to express ideas with words, diagrams, pictures, and symbols. When children talk, either with you or with their friends, it helps them think about what they are doing and makes their own thoughts clearer. As a bonus, talking with children improves their vocabulary and helps develop literacy and early reading skills as well.

What parents can do:

- Talk with your children and listen to what they have to say.
- Reading children's books that rhyme, repeat, or have numbers in them (available at your local library) is a great way to communicate using mathematics.
- All communication doesn't have to be in words. You can represent math in ways other than talking. Your children can make diagrams or draw pictures to solve problems or represent numbers. They can use concrete objects like pieces of paper or even fingers to represent numbers.

Reasoning: Reasoning is used to think through a question and come up with a useful answer. It is a major part of problem solving.

What parents can do:

- To promote reasoning, ask your children questions and give them time to think about the answer. By simply asking questions and listening to answers, you are helping your children learn to reason.
- Ask your children to figure out why something is the way it is and then check out their ideas. Let them think for themselves, rather than try to figure out what answer you want to hear.

Connections: Mathematics is not isolated skills and procedures. Mathematics is everywhere and most of what we see is a combination of different concepts. A lot of mathematics relates to other subjects like science, art, and music. Most importantly, math relates to things we do in the real world every day. Connections make mathematics easier for children to understand because they allow children to apply common rules to many different things.

What parents can do:

- Ask children to think about and solve problems that arise in your everyday activities. For example, ask children to help you put the groceries away. They will practice sorting—the cereal boxes and the soup cans—and experiment with relative size and shape—the big boxes take up more room than the smaller ones.
- Look for mathematics in your everyday life and don't worry about what the particular aspect of mathematics might be. Something as simple as pouring water into different sized cups and thinking about which cup will hold more is a low-key activity that actually involves estimation, measurement, and spatial sense.

Content Mathematics

Patterns and relationships: Patterns are things that repeat; relationships are things that are connected by some kind of reason. They are important because they help us understand the underlying structure of things; they help us feel confident and capable of knowing what will come next, even when we can't see it yet. Patterns and relationships are found in music, art, and clothing, as well as in other aspects of math such as counting and geometry. Understanding patterns and relationships means understanding rhythm and repetition as well as ordering from shortest to longest, smallest to largest, and sorting and categorizing.

What parents can do:

- Help your children find patterns in designs and pictures, as well as in movement and in recurring events such as the days of the week or the seasons of the year.
- For a hands-on activity try stringing wooden blocks or pasta necklaces into a simple red-blue-red-blue pattern. As children get older they can reproduce and create more complex patterns.

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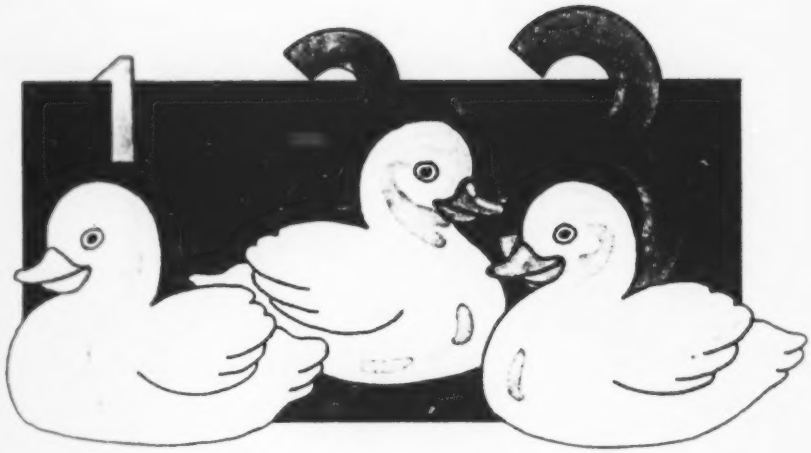


Number sense and numeration: Number sense is much more than merely counting, it involves the ability to think and work with numbers easily and to understand their uses and relationships. Number sense is about understanding the different uses for numbers (describe quantities and relationships, informational tools). Number sense is the ability to count accurately and competently, to be able to continue counting—or count on—from a specific number as well as to count backwards, to see relationships between numbers, and to be able to take a specific number apart and put it back together again. It is about counting, adding, and subtracting. Counting and becoming familiar with numbers will help your children understand all other aspects of math.

What parents can do:

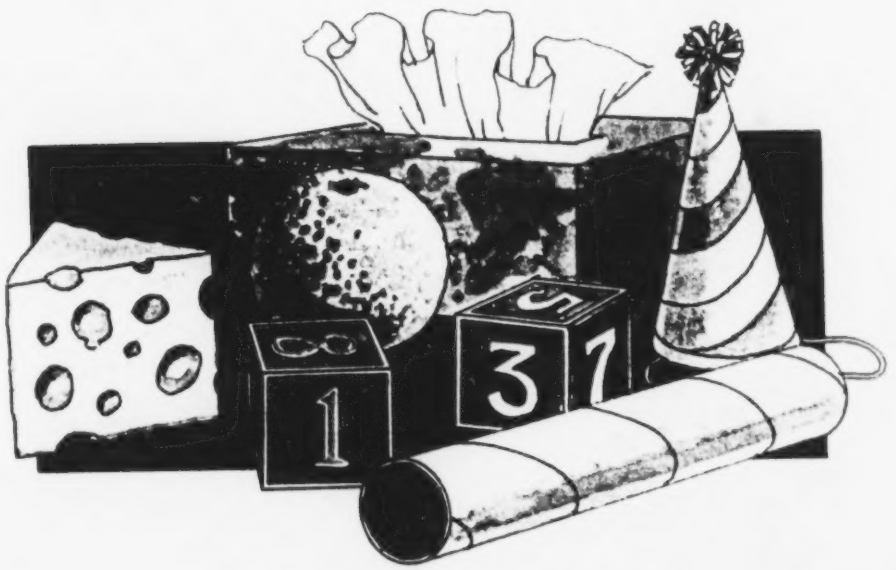
- Count anything and everything! Count real things to help children use their own experience with objects to better understand numbers. Therefore, one of the best math activities you can do with your children is to have them count real objects.
- To help children learn to count accurately and efficiently, up and down:
  - Point out that counting lets them know how many things there are in a group.
  - Point to the object as you recite each number name.
  - Use fingers to count. Put up a finger one at a time as you count it: fingers are tools you always have with you.
  - Help your children count without skipping numbers or counting something twice.

- To help children learn that numbers are used to describe quantities and relationships, encourage them to:
  - Sort objects looking for similarities in either color, shape, or size.
  - Sort objects looking for differences, like which box is bigger.
- Talk to your children about what numbers are used for, such as keeping score in a game, or finding an apartment or street address.

Geometry and spatial sense: Geometry is the area of mathematics that involves shape, size, space, position, direction, and movement, and describes and classifies the physical world in which we live. Young children can learn about angles, shapes, and solids by looking at the physical world. Spatial sense gives children an awareness of themselves in relation to the people and objects around them.

What parents can do:

- You can help your children learn geometry by helping them learn to identify different angles, shapes, and three-dimensional figures. Ask them to identify and describe different shapes, to draw them in the air with their finger, to trace over them with their fingers, and to draw them on paper.
- Children learn geometry best through hands-on experiences. Things they can touch and manipulate are particularly helpful, like blocks, boxes or containers, shape sorters, and puzzles. Even cutting the sandwiches they eat into different shapes and letting them fit them together or rearrange them helps children learn about geometry.

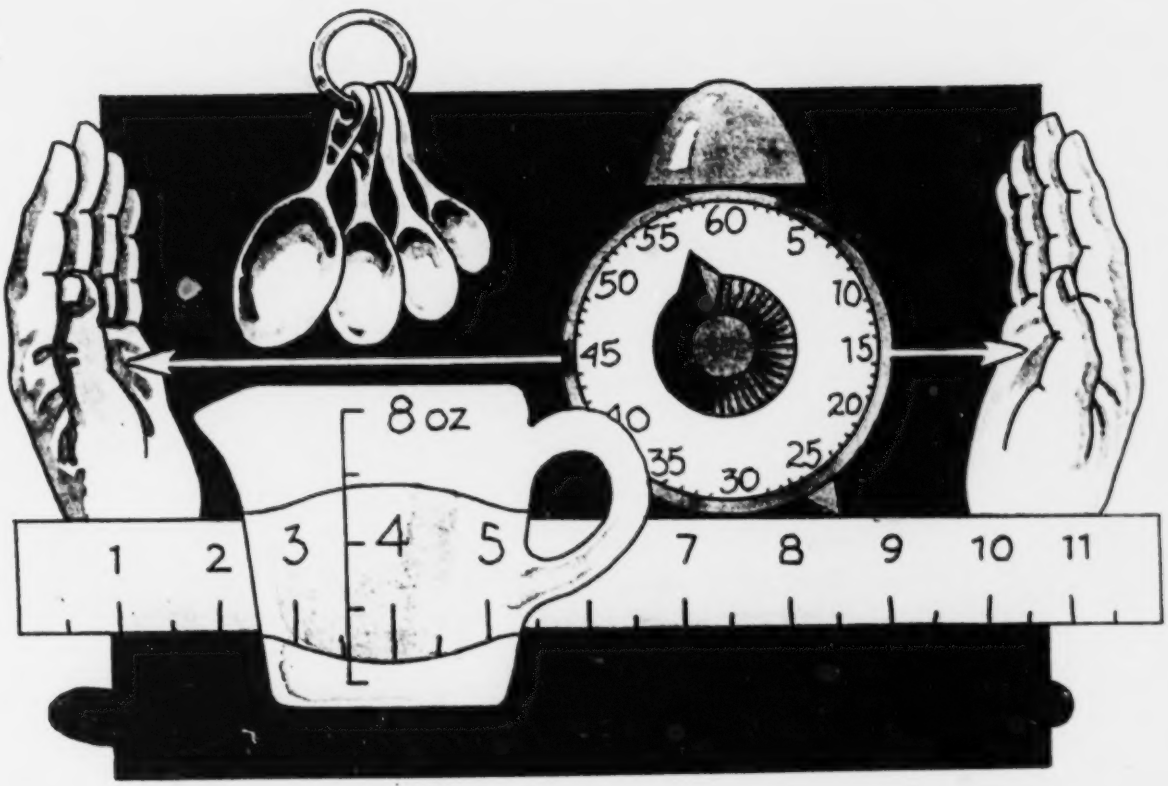


- Geometry and spatial sense help children with directions and finding their way around. Let them climb in and out of boxes, on or around furniture—going under, over, around, through, into, on top of, and out of different things to experience themselves in space.
- As children get older, they play games to find "hidden" triangles, squares, or rectangles that are turned in different ways or have odd shapes. Hidden shapes are ones that do not have flat bases, but are turned in different directions.

Measurement: Measurement is finding the length, height, and weight of an object using units like inches, feet, and pounds. Time is measured using hours, seconds, and minutes. Measurement is an important way for young children to look for relationships in the real world. By practicing measurement your child will learn how big or little things are and how to figure that out.

What parents can do:

- Standard measurements like inches, feet, and yards are only one way to measure. Let children pick their own unit for measurement—"Raymond is five cereal boxes tall."
- Many daily activities involve measurement: cooking, gardening, grocery shopping, sewing, and woodworking are only a few examples. Keep your child involved in these chores by talking with them about what you are doing, and by asking them to help you when possible.
- Young children won't understand the concept of time. However,
  - They can learn that some activities take longer than others. Compare one activity with another to figure out what takes more time. Start by asking simple questions like "Who can stand on one foot longer?"
  - Set end of time limits. "You can only play for 5 more minutes, then we have to go catch the bus." At first your children won't know what the minutes means, but gradually the children will understand the idea of time passing.
  - You can relate units of time to counting by using a watch to time events and counting the ticks on the second hand of the watch by saying, "1 second, 2 seconds, 3 seconds" without timing the event. This uses counting to help children develop a sense of the passing of time.
  - Start time talk with ideas like "after lunch" or "after dinner" that provide solid milestones for children. It is not until children are older that they understand more abstract notions like yesterday, today, and tomorrow.



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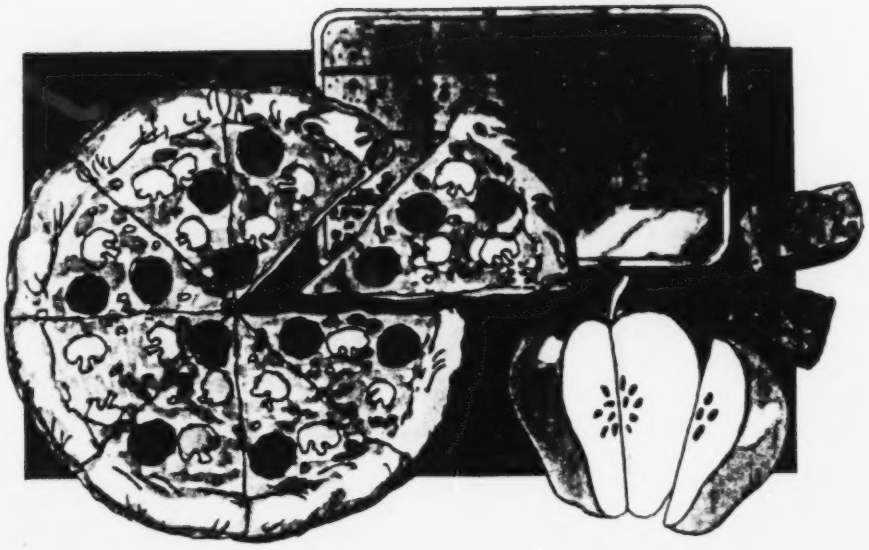


Fractions: Fractions represent parts of a whole. A very young child will see something cut into three pieces and will believe that there is more after cutting it than before it was cut. This is typical and should not cause alarm in parents. It is one example of how children and adults think differently!

To understand fractions, children need to think about:

- ✓ what the whole unit is,
- ✓ how many pieces are in the unit, and
- ✓ if the pieces are the same size.

What parents can do:

- ✦ Many sharing activities help children understand fractions by dividing food, chores, or treats into equal portions. Cutting up pizzas or sharing a pan of brownies are good ways to get children thinking about fractions.

Estimation: To estimate is to make an educated guess as to the amount or size of something. To estimate accurately, numbers and size have to have meaning. Very young children will not be able to estimate accurately, because they are still learning these concepts. They first need to understand concepts like more, less, bigger, and smaller. When children use estimation, they learn to make appropriate predictions, to obtain reasonable results, and they learn math vocabulary such as "about," "more than," and "less than."

It is important for children to learn:

- ✓ how to use estimation,
- ✓ when the technique is appropriate, and
- ✓ when the solution is reasonable.

What parents can do:

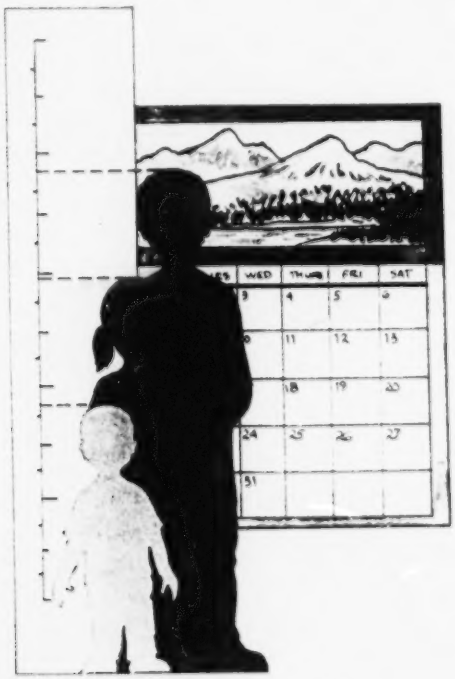
- ✦ Regularly use words such as "about," "near," "approximately," "in between," "around," "more than," and "fewer than."
- ✦ To practice estimation, use any daily activity like eating or going to the store. Ask your child to make an estimate of how much, how long, or how many. When you find the actual answer, compare it with the estimate you originally made. This will help your child learn to make reasonable guesses.
- ✦ Estimation activities may sound complicated, but they don't have to be. Just take a guess about something—like which one of his friends is the tallest—and then check it out for accuracy.
- ✦ To help older children learn estimation, write down the estimate and then the actual count. If you repeat the problem or give a similar problem, children will eventually estimate closer to the real count. It isn't important to get the "right" answer, but to see how close children can come. Help them practice the technique to improve their estimation skills.

Statistics and probability: Using graphs and charts, people organize and interpret information and see relationships. Graphing is another way to show and see information mathematically. Charts, including calendars, can be used to organize everyone's weekly activities. Even older children in elementary school may find it hard to keep track of calendars, but, when adults use them with children, calendars can be helpful tools to learning and understanding how we organize information.

Statistics, like batting averages in baseball, tell stories about our world. We know which player is having the best season and which batter is most likely to hit a home run. Probability tells the likelihood of something occurring.

What parents can do:

- Practically everything you do is "chartable." For example, you can take the stickers from bananas, apples, or pears and place them in columns on a piece of paper. At the end of the week you can count them up to see how many of each type of fruit you ate. Graphs help some children reach a greater understanding of numbers because they can see quantities displayed on paper. This may help them understand math more than looking at numbers on paper.
- Use color forms or stickers to record any regular daily activity. Put a color form next to the phone each time it rings, or have people put one next to the front door to record the number of times someone enters.



Activities for Your Day

Getting Up in the Morning

Jordan was getting dressed slowly so Mommy decided to try something new. "Jordan," said Mommy, "if you can get ready and be in the kitchen in 15 minutes, you can pick out whatever cereal you like." Jordan was ready in 10 minutes.

- ● When you get your children up in the morning, ask them to stretch as high as they can. Then let them hop or crawl across the room. Even sleepyheads can have fun using their muscles, and these movements help them understand themselves in space.
- ▲ Morning is a good time for children to learn that some things take longer than others. Use a timer or hourglass that is set to a given number of minutes and see if your children can get dressed in that amount of time. They can try to do other activities in that same amount of time.
- ■ If you don't have a timer of some kind, count out loud evenly..."1 second, 2 seconds..." as children get dressed to see how many seconds it takes them to get dressed. Children will hear the numbers, which will help them learn to count, and they will begin to develop a sense of duration.

● = simple ▲ = moderate ■ = challenging

● When your children get dressed, ask them to match the colors of their clothes. "Let's wear yellow today. Can you find your shirt with the yellow duck?" As they get older, ask them to look for patterns in their clothing. There can be patterns with alternating colors, stripes or plaids, squares or circles, or pictures—like big flowers followed by little flowers. Ask children to find and describe patterns, "My shirt has a pattern. It is red, blue, red, blue." Patterns are tools that we use to solve problems because they help us predict what comes next.

●■ Discuss the events of the day with your children: first we eat breakfast, then you go to child care or school, then we will go to the park. With your older child, say when events will happen—in the morning, afternoon, evening, or night. "In the morning we get up. In the evening we go to bed." This will help your children understand the sequence of events—another pattern. Knowing what comes next helps us find structure in our world and helps children feel secure and confident.

▲ Ask your children to estimate how many spoonfuls it will take to finish their cereal. Count each spoonful as they eat. This playful way of eating breakfast can be fun for toddlers to practice counting! If you repeat this activity over time, older children will get practice in predicting.

● = simple ▲ = moderate ■ = challenging

▲ In the morning, read a thermometer or listen to the radio to hear the weather forecast. Then, ask your children what clothes they should wear that day. This will give meaning to the temperatures you just read or heard. You might even compare the temperature inside with the temperature outside.

In the Car, Subway, or Bus

While Daddy was driving Morgan to child care, he pointed to the yield sign and said, "Look, Morgan, a triangle!" As he drove past a highway sign, Daddy asked, "What shape is that sign, Morgan?" Morgan happily shouted, "It's a rectangle, Daddy!"

● Little children can learn the names of different shapes. Traffic signs are a good place to start. Yield signs are triangles, highway signs are rectangles, and stop signs are octagons. Ask children about the signs they see. "Is this sign just like one you saw on another block?" Talk about how many sides it has, or how many corners it has. Older children may talk a lot about what they saw. "That sign is a rectangle. It has 4 sides and 4 corners." But for younger children, you may be doing most of the talking, "That sign is yellow. It is shaped like a triangle."

■ Children can also learn to create shapes. Ask your children to draw the shape of the street sign in the air.

▲ Children learn that people communicate with symbols. Again, traffic signs are a good place to start. You might point out how the shape of the street sign helps people know what the sign means. Point out that the yellow triangle means let the other car go first, the red sign with so many sides (eight sides—octagon) means stop. The link between symbols and the concepts they represent is not always clear to children. Keep restating the meaning, but don't push. Children will make the connection when they are ready.

■ Have your children "estimate" how many minutes it will take to walk or drive big sister or brother to school. Using a clock or watch, time how long it really takes and compare your children's estimate with the actual time. "I think it takes 6 hours to walk Marcus to school. No, it only took 5 minutes. Six hours is a really long time." This will help them develop a sense of the passage of time. Children learn by thinking for themselves: let them make their own estimates and then check out its accuracy.

■ Compare to see which takes longer: riding to Tio Raul's on the bus or in a car. Mathematics will help your children answer questions from their own world.

● = simple ▲ = moderate ■ = challenging

▲ Think of a number between 1 and 10. Give your children clues like "bigger" or "smaller" and ask them to guess the number. Besides being a fun way to pass the journey, it will help your children develop a "mental number line" as they think about different numbers and how they relate to one another.

▲ Show your children how to make a graph out of stickers so they can record when the stoplights are red or green. To start, take a piece of paper or cardboard and draw a line down the middle to make two columns—one with a red x on the top and the other with a green x on the top. Ask them to put a mark in the red column every time you stop at a red light and a mark in the green column when you go through a green light. Then ask them if there were more red than green, fewer red than green, or the same number of each. Children will learn a little about data recording and interpreting and see that numbers can tell them something about their own life.

■ Ask children to look for numbers in the environment, like the numbers on street signs, storefronts, or license plates. Talk about the different things people use numbers for—like finding things, naming things, or giving out other information like prices.

▲ Play license plate games. Read aloud the numbers on license plates; find a license plate with the number two; or look for license plates with your child's age on them. Children can practice recognizing numbers or finding patterns.

●▲■ Sing songs that rhyme, repeat, or have numbers in them. Examples are "Twinkle, Twinkle, Little Star" and "One, Two, Buckle My Shoe." These songs reinforce patterns in words and sound, and are playful ways for children to practice language and mathematics skills. Try a backwards counting song, like "Five Little Monkeys" to reinforce children's understanding of the fixed ordering of numbers.

■ Practice counting. Ask children to count to a specific number, count until you arrive at your destination, or just count as high as they can go.

▲ Count the telephone poles as you pass them. This not only practices counting but also gives children a sense of rhythm and its relationship to time and space.

● = simple ▲ = moderate ■ = challenging

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Waiting at the Doctor's Office or Other Places

Marcus and Keisha dreaded being at the dentist's office. To pass the time, Gram asked them to look for things that repeated. Keisha said, "Look at my shirt. It has a red stripe, a blue stripe, and then another red and another blue." Marcus found patterns in the rug and in the wallpaper. Since they were still waiting, they looked around the room and found patterns everywhere—the way the magazines were put on the table, the way the lights were put on the walls, and even the way the tiles were placed in the ceiling.

- ■ Look for patterns—anything that repeats—on the rug, on the wallpaper, or on the furniture. Patterns are on clothes, too. Describe the pattern: "It has blue stripes followed by white space and then another blue stripe..."
- ▲ Ask your children to use their fingers to trace the patterns you find on the chair or your clothes. They don't have to be able to draw. Tracing with their fingers helps children understand shapes and they love the sense of connecting and exploring.

● = simple ▲ = moderate ■ = challenging

▲ To help children pass time waiting, ask how many people are ahead of you and then subtract one—or count down as patients are seen. Count how many are left waiting.

● Read books that rhyme, repeat, or have numbers in them. Count the animals, flowers, or trees throughout the book. Name the colors or shapes you see and then count all of those with one color.

●▲■ Keep counting! Count anything and everything! Counting is one of the best and easiest ways to introduce your children to mathematics. Young children can't always count accurately—they make mistakes like counting the same object more than once. Don't worry about mistakes. Instead, take the child's finger and point to, or touch, the object as you both count.

▲ You can play a game of remembering with older children. Draw shapes on paper. Then, flip the paper over and see if your children can draw, trace in the air, or describe to you, the shape they just saw. Don't worry if they can't remember. As you do this activity again, they will begin to develop strategies for remembering shapes and numbers.

● Younger children can play with puzzles and older children will enjoy games that involve shapes in different positions or patterns. These are great "hands-on" activities that help children understand spatial concepts.

■ For older children, make pieces of paper that get progressively larger and put numbers on them that get larger as the paper size increases. Ask children to place the pieces of paper in order. The size of the paper and numbers allow them to use either their knowledge of numbers, or the relationship of size and helps children associate the larger numbers with larger size.

● = simple ▲ = moderate ■ = challenging

At the Grocery Store

As Dad picked the can of soup off of the shelf, he asked Jamal, "What shape is this can?" Jamal replied, "A circle!" "Very good, Jamal." The shape of the whole can is actually called a cylinder, but Dad was happy that Jamal was recognizing the shapes on the bottom of the can.

- ■ Ask your children to find circle shapes on the can of soup or the square on the box of rice. Play a game in which you look for other items that are the same shape as you go through the store. It will help young children begin to recognize, identify, and describe shapes, a skill which will help them better understand geometry.
- ▲■ Younger children can understand that the managers of the store have sorted items by type and placed them together in aisles. For older children, point out that each aisle has a number. Let your children help you find an aisle by its number or find in which aisle a particular item can be found. Some children love to count off the aisle numbers as they go through the store.
- ● Talk about the items as you place them in the basket. "Here's our cereal. Wow, this box is a big yellow rectangle. Now we have three boxes in the basket."
- ● Count oranges, apples, or eggs with your children.
- ■ Show your children where to find the price of items. Read the amounts out loud. Point out that some numbers are bigger than others; some containers are bigger than others, and some items are more expensive than others. At check out, read the numbers out loud as they appear on the screen.
- ■ Before you put away the groceries, let your children sort them into piles such as cans and boxes, in the refrigerator or on the shelf. Finally, have them sort the groceries however you want them to be put away!

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In the Kitchen

Kaitlyn and Kevin were racing around in the kitchen while Mommy was getting dinner ready. "Kaitlyn, why don't you see if you can fit these pots and pans together for me," said Mommy. "And Kevin, I need 1/4 teaspoon of salt. Can you find the measuring spoon for me?" Soon, everyone was busy and dinner was cooking.

- ● Young children enjoy playing with empty plastic food containers or pots and pans. Encourage them to stack them on top of, or inside of each other. Many children will stay busy for a long time as they touch and handle objects, learning shapes, size, and relationships.
- ■ Tell your children how many minutes the dinner needs to be in the oven. Close to the end, encourage them to watch the final minutes count down on the timer or the microwave and count the last ones together. Children love to count down with the timer and this is good practice.
- ▲ When making dinner, ask your children what shape baking dish you should use and why. Would the food fit in a dish that is another shape, too?
- ■ Most children love to help you bake. Let them help put together the ingredients as you read out loud the amount. "We need a cup of flour. Can you find the measuring cups for me?" Older children can help you measure some of the less messy ingredients. Cooking is a great way for children to learn about sequences. "First we put in the flour, then we add the eggs..."
- ■ Cooking provides a good opportunity for children to learn fractions. When making something with dough, cut off a piece and give it to your children using words like half, quarter, and tenth. For example, "Let me give you children half of the dough to make your own cookies. I'll give Shawndra a quarter of the dough, and Raymond the other quarter."
- ■ When you are making rice for dinner, pour uncooked rice or water into a tall, thin container. Then pour the rice or water into a short, fat container after guessing whether or not it will spill over or look less full than the tall container. Things that are obvious to adults are not obvious to children and are often hard to explain. This game is a fun activity for letting children find out about quantity.

● = simple ▲ = moderate ■ = challenging

Meal Time

Mama asked Maria to help set the table for dinner. "Let's count as we go," said Mama. When Maria was done, she proudly exclaimed, "I put 4 napkins and 4 spoons on the table!" Mama pointed out that the place settings follow a pattern: they all have 1 fork, 1 cup, 1 napkin, and 1 spoon in the same place.

- ■ Ask your children to help set the table. Show them how you want the table set—the pattern of plate, cup, and silverware—and ask them to repeat that pattern for each person. Some children will count out the napkins, knives, forks, spoons, and plates as they take them to the table. Others may set the table one piece at a time. Let them develop their own strategy for getting the table set. Their strategy may evolve over time.
- ● To make eating more fun, cut your children's food into different shapes. Cut scrambled eggs into triangles, or sandwiches and fruit into circles or squares. Don't limit yourself to simple shapes, but use your imagination and create different designs. You might enjoy having a theme for a day. Serve round foods like crackers, cookies, or tortillas for a snack. Mention that all of the snacks are round. Do the same with foods of other shapes or use pasta that comes in shapes, including letters and numbers.

● = simple ▲ = moderate ■ = challenging

▲ When you buy your children a bag of candy or raisins ask them to estimate how many pieces are in the bag. Dump them onto a napkin and count to see if there are more than, less than, or the same as the amount they estimated. If possible, sort the candy by color or shape. Don't forget to count the pieces as they eat them. Keep track of how many a child has eaten and how many are left to eat. "Here are 5 raisins. When you eat 1, you have 1, 2, 3, 4 left. Eat another 1. So you now ate 2. How many are left?"

● Share a banana, sandwich, or cookie by splitting it into two parts of the same size. Explain to your child that each of you is eating one-half. You also can share four cookies between the two of you and explain that, once again, you each are eating one-half of the original amount. This connects the language for fractions with the concept.

■ For an older child you might cut some treat in half and then cut one of the two pieces in half again so that you wind up with two quarter pieces and one half. Ask your child to take one piece and then ask why he or she chose that piece.

▲ Let your children help you divide dinner or dessert into equal parts for each member of your family. First explain the problem—how can everyone get a fair share? Ask them to help you work this out.

● = simple ▲ = moderate ■ = challenging

▲ You can extend the idea of cutting a cake or pizza into shares. Talk with your children to find out how many shares you can get from a whole pizza or cake and what size the shares will be. Children will see that as more people share, the size of the shares gets smaller.

■ Children can use mealtime to understand the relationships within and between shapes. Cut your children's sandwich diagonally to make 2 triangles, up and down to make 2 rectangles, or in 4 parts to make 4 squares. Ask your children to name the shape and experiment with putting them back together.

▲ Give your children a calendar and ask them to keep track of how many times each week they ate their favorite food. They can mark the calendar with any kind of notation they make up themselves.

Around the House

Granddad was so proud of little Jesse. He loved to play with him and give him snacks. As Granddad handed out pretzels he counted, "1 for me, 1 for you, 2 for me..."

Counting

●▲■ With your younger children count, "1 for me, 1 for you, 2 for me..." With your older children try counting items by 2s (2, 4, 6, ...) or by 5s (5, 10, 15, ...).

● Have fun counting out loud anything that has quantity—food that you eat, stairs as you climb them, shoes as you put them away, or the number of times the phone rings before you are able to answer it.

■ Practice understanding quantities. Ask your child questions about which is bigger or smaller, who is taller or shorter, or which bag has more or fewer raisins.

Special days

▲ Count down on the calendar the number of days or weeks until your child's birthday or some other special day. Do this every day until the big day arrives.

● = simple ▲ = moderate ■ = challenging

▲ Keep a calendar. This helps children learn the names of the days of the week and how many days of the week there are. Use stickers or a special mark for sunshine, raindrops, and snowflakes and keep track of the weather. Count each notation at the end of the month.

● Keep a record of your children's height by marking the wall and measuring the height every month, or every year. Young children enjoy seeing how big they are getting and predict how big they will be next year. The marks on the wall are simply a graph of their growth.

●▲■ When you have something to measure, let your children help by holding the ruler or the yardstick. Older children can figure out ways to measure things. Remember, inches, feet, and yards are just one way of measuring. Let them use informal units, like footsteps, as well. This will help them understand the concept of measurement.

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Housekeeping

- Let your children sort the dirty clothes by color before you wash them. Once the clothes are clean they can sort them again—by matching the socks or sorting clothes into piles for each member of the family. This helps children classify objects and better understand the concept of number.
- Get children used to the idea of fractions by splitting up some household chores. "You clean up this half of the room and Roberto will clean up the other half."
- Put different shoes in a pile and ask your children to match up the pairs of shoes. After they are all properly matched, count the pairs, explaining the difference between single shoes and pairs of shoes. The children will also notice the difference in the size, shape, and color of the shoes.

Playtime

"Time to clean up, Nina," said Tia Juanita. "Let's put the dirty clothes in the basket and take all the dishes back into the kitchen." Nina carefully placed most of the clothes in the correct basket before she curled up with her blankie for a nap!

- Ask your children to put things into 2 piles of things that belong together. Almost any group of things you have in your home can be sorted in some way. Sort clothes by clean or dirty, shoes can be sorted large or smaller, shirts can be sorted by color, type, or size. Next time, sort them another way. Let the children use their imaginations to come up with different sorting rules.
- ●▲■ There are puzzles for all ages and 4- and 5-year-olds love to play board games. These activities help children learn math concepts such as counting, planning ahead, thinking of patterns and finding patterns, and understanding how much. If you play with your children and win, share your strategy for playing with them so they will develop strategies too.

● = simple ▲ = moderate ■ = challenging

●▲■ Build with blocks, empty boxes, or milk cartons. Because these items are three-dimensional shapes that can be handled, children can use them to combine, divide, and change shapes. They learn to recognize geometry in the real world as well as the relationships between and among shapes. Children can use 2 triangles to make a square or rectangle; 2 semicircles to make a circle. By fitting one shape over another—like a triangle over a square to make a house figure—they can see how the shapes relate to each other. When children build with blocks, make sure to ask them why they are using certain shapes. It gets them thinking about what they are doing.

● Younger children can play with sorting toys, putting circles in the circular opening, squares in the square opening, and so on. They learn to identify shapes and match the shapes with the spaces.

● = simple ▲ = moderate ■ = challenging

●▲ Provide your children with books, records, or tapes from your local library. Look for stories or songs that rhyme, repeat, or have numbers in them. Children love to be read to, but they also like to look through the pictures by themselves.

■ Give your children large pieces of chalk or a rock and let them draw shapes on the sidewalk or in the dirt. This is good practice at drawing shapes.

● Roll balls and stack boxes with your children to help them become familiar with how different shapes move and fit together. Sort the blocks by those that roll, those that stack, and those that do both. As your children play with containers they are learning about shape and size and also practicing their mathematical thinking.

▲ Play "head, shoulders, knees, and toes…" to become familiar with patterns.

▲ Ask your children to estimate who among them is tallest and then let them figure out how to do the measuring. This simple activity will help them get a sound understanding of numbers, measurement, and estimation.

▲ Choose a family characteristic like hair or eye color. Count how many people in the family have different forms of that characteristic. Write down the results and make a graph using stamps, stickers, or simple notation.

● = simple ▲ = moderate ■ = challenging

- ● Give your children old cardboard boxes to climb in and out of. You can even open two ends and make a tunnel for them to crawl through. This is a fun way for children to learn about themselves in space.
- ● Very young children enjoy stacking boxes. Collect boxes that fit one into another and let your children stack them. This helps children understand the relationship among objects.
- ■ Take a walk around the neighborhood or in your home and look at the numbers on everything. Outside there are numbers on buildings, on some streets, on cars, and on telephone poles. Inside, find numbers, read them out loud and talk with your child about how the numbers are used. Some numbers, like those on baseball uniforms, are used like names; others are used to tell you the order of something, or the amount.
- ■ Ask your children how many types of numbers they can find in your house, or how many windows they think you have. Write down their answer, and then go around with them and count them all up.
- ■ Dice are fun for children to learn numbers and counting. There are many games you can play with dice that will help children learn about numbers. They will practice counting; learn which numbers are bigger and smaller than others; and after a while they will begin to know how many numbers are on each cube just by seeing them and without counting each time.

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Games for More Than One Child

On Matt's birthday, Mommy wanted to invite some of his friends to play. "How many people should I invite?" Then Sara had an idea. "Since he's 3 years old, he should have 3 friends." "That's a good idea," said Mommy. "We can have 3 of everything—we'll have 3 guests, eat 3 crackers, and play 3 games."

- ■ Set up a mystery game in which children can feel shapes and then figure out what shape it is. You can do this by putting objects into a paper bag. One at a time ask each child to reach in and feel the shape inside the box. Set up 5 shapes on the table that match the shapes in the box. Ask the child to match the shape on the table with the shape in the box.
- ■ Put on your own "Olympics." Ask your children to jump up and down or move their wheelchair to the sidewalk and back as many times as possible in a given amount of time. Measure how far your children can jump or how far they can throw a ball. No need to be competitive. Just have each child measure his or her own accomplishments.
- ▲ Children love to string pasta shells with large holes to make necklaces and other jewelry. This helps them relate geometric ideas to number and measurement, and also helps them practice sorting and making patterns.
- ■ Have a treasure hunt. Give each child a paper bag and ask them to find things of a certain shape that you have put around the room or outside for them.
- ▲ Collect a number of objects in various sizes—a plastic container, a soap dish, a sock, or even the tube from an empty roll of paper towels. Ask each child to take two items with something in common. As they match the items, ask them to tell you what they have in common. They may all be white, round, or plastic. Play until all the items are gone. This helps children classify things and find relationships.

● = simple ▲ = moderate ■ = challenging

Getting Ready for Bed

"Climb into bed, Vincent, and I will read you a story," said Papa. Vincent already had picked out his favorite book. As he fell asleep, Vincent could hear his Papa read, "Twinkle, twinkle, little star, how I wonder what you are…"

- ● Give your children cups of different sizes and shapes as well as other toys to play with while you give them a bath. This is a fun way for your children to touch and play with different objects. Talk with your children about what they are doing when they are playing with the toys and water. Give them a variety of objects to take into the tub when you give them a bath and ask them to predict whether it will sink or float. Try soap, a ping pong ball, a toy action figure, or just about any water proof object.
- ▲ Play "beat the clock" with a timer or an hourglass while putting on pajamas; offer a special treat, like reading an extra book before bed, if they get dressed in 3 minutes.
- ▲ If your children leave the water running while they brush their teeth, try having them plug the sink before they begin. Ask them to think about how full the sink will be when they are finished—half full? Almost full?
- ● Read counting books out loud, or read books that rhyme, repeat, or have numbers in them. Reading is fun and a special way to introduce mathematics topics to your children. Some children love to count along with the pages and others love to identify the number.
- ■ Look for patterns in their pajamas—or let them pick their favorite color. The important thing is to get them thinking about color, shape, size, and relationship.

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Appendix

Books

Reading is a great way to communicate mathematical concepts to your child. It also is a wonderful opportunity to spend time together. You will find most of these books at your local library. Some are available in Spanish.

Aker, Suzanne. *What Comes in 2s, 3s, & 4s?* Simon & Shuster.
Allen, Pamela. *Mr. Archimedes' Bath.* Lothrop, Lee, and Shepard Books.
Anno, Mitsumasa. *Anno's Counting Book.* Thomas Y. Crowell.
Anno, Mitsumasa. *Anno's Counting House.* Thomas Y. Crowell.
Anno, Mitsumasa. *Anno's Hat Trick.* Thomas Y. Crowell.
Anno, Mitsumasa. *Anno's Math Games.* Thomas Y. Crowell.
Asbjornsen, Peter Christen. *The Three Billy Goats Gruff.* Harcourt.
Bang, Molly. *Ten, Nine, Eight.* Greenwillow Books.
Barchers, Suzanne and Peter Rauen. *Storybook Stew: Cooking with Books Kids Love.*
Bufano, Remo. *Jack and the Bean Stalk.* Macmillan.
Carle, Eric. *My Very First Book of Numbers.* Philomel.
Carle, Eric. *1, 2 ,3 To the Zoo.* Philomel.
Carle, Eric. *The Grouchy Ladybug.* Philomel.
Carle, Eric. *Rooster Off to See the World.* Philomel.
Carle, Eric. *Today's Monday.* Philomel.
Carle, Eric. *The Very Busy Spider.* Philomel.
Carle, Eric. *The Very Hungry Caterpillar.* Philomel.
Children's Television Workshop. *The Sesame Street Book of Shapes (Book of Numbers and Book of Puzzles).* New York Preschool Press. Time-Life Books.
Christelow, Eileen. *Five Little Monkeys Sitting in a Tree.* Clarion Books.
Conford, Ellen. *What's Cooking, Jenny Archer.* Turtleback.
Cooke, Tom. *Sesame Street Cookie Monster's Little Kitchen: A Chunky Book.*
Crews, Donald. *Ten Black Dots.* Greenwillow Books.
Falwell, Cathryn. *Feast for 10.* Clarion Books.
Feelings, Muriel. *Moja Means One: Swahili Counting Book.* Dial.
Florian, Douglas. *A Year in the Country.* Greenwillow Books.
Galdone, Paul. *Goldilocks and the Three Bears.* Seabury Press.
Giganti, Paul Jr. *How Many Snails?* Greenwillow Books.
Heinst, Marie. *My First Book of Numbers.* Dorling Kindsley Inc.

Hoban, Tana. *Exactly the Opposite*. Macmillan Publishing Co., Inc.
Hoban, Tana. *More than One*. Macmillan Publishing Co., Inc.
Hoban, Tana. *1, 2, 3*. Macmillan Publishing Co., Inc.
Hoban, Tana. *Round and Round and Round*. Macmillan Publishing Co., Inc.
Hoban, Tana. *Where is It?* Macmillan Publishing Co., Inc.
Hughes, Shirley. *Rhymes for Annie Rose*. Lothrop, Lee, and Shepard Books.
Hughes, Shirley. *The Nursery Collection*. Lothrop, Lee, and Shepard Books.
Hulme, Joy N. *Sea Squares*. Hyperion Books for Children.
Hutchins, Pat. *Clocks and More Clocks*. Macmillan Publishing Co., Inc.
Hutchins, Pat. *The Doorbell Rang*. Macmillan Publishing Co., Inc.
Inkpen, Mick. *Kipper's Book of Numbers*. Red Wagon Books.
Pelham, David. *Sam's Pizza: Your Pizza to Go*. Dutton Books.
Plummer, David and John Archambault. *Counting Kittens*. Silver Press.
Prelutsky, John. *Read Aloud Rhymes for the Very Young*. A. Knopf.
Tafuri, Nancy. *Who's Counting*. William Morrow & Co.
Ward, Cindy. *Cookie's Week*. G. P. Putman's Sons.

Other Resources

Computer programs, when used appropriately, can be wonderful ways for all children to learn, especially children with disabilities. The computer provides activities that require little physical movement and make use of several senses, including sight, sound, and sometimes touch. Most are so colorful and fun that you may have trouble getting your child to play with anything else! Make sure the program keeps your children thinking.

Mathematics for the Young Child. edited by Joseph Payne. NCTM 1990.

Whitin, David and Sandra Wilde. *Read Any Good Math Lately?* Heinemann, 1992.

Organizations

Family Math
Lawrence Hall of Science
University of California
Berkeley, CA 94720
Telephone: (510) 642–1823
Fax: (510) 643–5757
http://theory.lcs.mit.edu/~emjordan/famMath.html

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First-level Mathematics (KinderMath)
38 North Waterloo Road
Devon, PA 19333
Telephone: (610) 687–6252

National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 22091
Telephone: (703) 620–9840
Fax: (703) 476–2970

National Association for the Education of Young Children
1509 16th Street NW
Washington, DC 20036–1426
Telephone: (202) 232–8777; (800) 424–2460
Fax: (202) 328–1846

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